Mini User Manual

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Preface

About this Manual

The new Teranex Mini releases the power and 'Best Picture Always' of Teranex into hand-held, portable applications. The Mini opens up a gateway of production applications previously not achievable due to cost factors.

Utilizing the Silicon Optix Realta chip (three years and $30 Million invested in development), Teranex leads the industry by providing low-cost products in very small form factors, while maintaining the renowned Teranex image quality.

The Teranex Mini is a DTV format converter that converts SD video to and from HD in real time with exceptional quality. This new form factor enables applications such as HD field monitoring and conversion of SD camera and graphics sources to HD.

Of importance, the Teranex Mini becomes a useful tool for the independent producer. In its most basic form, the Mini enables SD/DV productions to be presented in HD, with resolution and clarity approaching that of native HD/HDV. For the producer that is mixing DV and HDV content into the editing timeline, the Mini enables up-conversion of the DV source to HD in real time at high enough quality levels to effectively match the HDV content. The final product may then be delivered in both SD and HD simultaneously by routing the SDI output back through the Mini on play out. This real-time process not only saves time but also provides quality levels much higher than is currently available within the editing applications.

The Teranex Mini has SD/HD SDI inputs and outputs along with optional DVI, analog component, and HDMI outputs. It may be used equally well to feed a VTR, display, or video projector. Control is available via front panel, OSD, or RS-232. Three Minis may be mounted in a 1RU frame. A vertical clamshell mount is also available for desktop applications.

This manual contains the following chapters:

Chapter 1, **Overview**: This section has a general description of filters and algorithms used by the Mini, a table showing the formats supported by the various applications and delays in the signal that occur for the different applications and a description of the applications themselves.

Chapter 2, **Hardware**: This section covers the connectivity of the Mini and its front panel controls.

Chapter 3, **Configuring The Mini**: This section covers the settings available via the On Screen Display.

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Appendix A, **Factory Reset Settings**: This appendix covers the Factory Reset Settings. When the Mini is reset, these are the settings that are used.

Appendix B, **Remote Control**: This appendix covers the user controls available from the Remote Control..

Audience

The Mini User Manual is designed for all users of the Mini.

Related Documents

- *None*

Book Conventions

This user manual includes the following conventions:

- *Italic* type is used occasionally for emphasis in the text. Italics also indicate cross-references within this manual, or references to other documents.
- **Bold** type indicates labels in windows, dialog boxes, menus, menu options, list boxes, text boxes, checkboxes, control buttons, option buttons, and other screen elements.
- **Bold** type, between *greater than, less than brackets (< >)* is also used to indicate keys on your keyboard (for example <**Ctrl**> for the Control key).
- The carriage-return key, sometimes marked as a bent arrow on the touchscreen keyboard, is called <**Enter**>.

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Chapter 1
Overview

Broadcast Quality Up-conversion

In situations where the highest image quality up-conversion is necessary, Teranex's Mini-UPC-4F uses proprietary PixelMotion™ De-interlacing, 3:2 Detection, and Detail Enhancement combined with a powerful array processing module, provides the best image solution.

The first step in the up-conversion process is to identify whether the input material is video or film originated. The identification process happens in a fully automatic mode and selects either PixelMotion De-interlacing for video based material or 3:2 Detection for film based material. The goal is to apply the appropriate filter in order to recover the full vertical resolution of the input material.

PixelMotion de-interlacing produces perfect progressive frames in preparation for further processing. The processing aperture is adjusted on a pixel-by-pixel basis, which preserves all of the detail of the original interlaced image. Additionally, the filter eliminates 'jaggies' in the HD image providing well-defined edges on objects and producing the sharpest images possible.

3:2 Detection recognizes the redundant fields inserted by the telecine during the conversion of film to video. This advanced 3:2 pulldown filter avoids frame rate conversion artifacts and provides the highest vertical resolution and motion quality.

Since the quality of the video de-interlacing is so high there will be no difference visible in the vertical resolution seen with film originated material and that of the de-interlaced video originated material.

Once the image has been de-interlaced and up-converted, Detail Enhancement can be applied to the image to further sharpen enhance the output. This filter adds an additional level of image quality by helping to better define the detail in the up-converted image. Detecting the edges of objects and adjusting the contrast ratio around those objects to help separate them from the background achieves this.

Monitoring Quality Up-conversion

In situations where the up-conversion need is for monitoring applications, Teranex's Mini-UPC-2F uses proprietary Diagonal Filter De-interlacing to provide the best image solution.

Broadcast Down-conversion

In situations where the highest image quality down-conversion is necessary, Teranex's Mini-DNC-4F uses proprietary PixelMotion™ De-interlacing, 3:2 Detection, and Detail Enhancement combined with a powerful array processing module, provides the best image solution.

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The first step in the down-conversion process is to identify whether the input material is video or film originated. The identification process happens in a fully automatic mode and selects either PixelMotion De-interlacing for video based material or 3:2 Detection for film based material. The goal is to apply the appropriate filter in order to recover the full vertical resolution of the input material.

PixelMotion de-interlacing produces perfect progressive frames in preparation for further processing. The processing aperture is adjusted on a pixel-by-pixel basis, which preserves all of the detail of the original interlaced image. In addition, the filter eliminates 'jaggies' in the HD image providing well-defined edges on objects and produces the sharpest image possible.

3:2 Detection recognizes the redundant fields inserted by the telecine during the conversion of film to video. This advanced 3:2 pulldown filter avoids frame rate conversion artifacts and provides the highest vertical resolution and motion quality.

Since the quality of the video de-interlacing is so high there will be no difference visible in the vertical resolution seen with film originated material and that of the de-interlaced video originated material.

Once the image has been de-interlaced and down-converted, Detail Enhancement can be applied to the image to further sharpen enhance the output. Using an industry standard 'unsharp' mask, this filter adds an additional level of image quality by helping to better define the detail in the up-converted image. Detecting the edges of objects and adjusting the contrast ratio around those objects to help separate them from the background achieves this.

Monitoring Quality Down-conversion

In situations where the down-conversion need is for monitoring applications, Teranex's Mini-DNC-2F uses proprietary Diagonal Filter De-interlacing to provide the best image solution.

Up/Down/Cross-conversion

The Mini UDCS package combines the Up, Down, and Cross conversion features into a single package addressing all possible conversion requirements.

Up/Down/Cross-conversion with Noise Reduction

The Mini UDCSN package combines the Up, Down, and Cross conversion features into one package addressing conversion requirements, and adds powerful noise reduction for the highest image quality.

Filters and Algorithms

PixelMotion De-interlacing: De-interlacing of video originated material produces perfect progressive frames in preparation for further processing. The processing aperture is adjusted on a pixel-by-pixel basis, which preserves all of the detail of the original interlaced image and eliminates 'jaggies' in the output image.

Scene Change Detection: Preserves clean cuts between scenes. Upon detecting a cut, the temporal aperture is reduced from 4-fields to 2-fields for the first frame in the new scene. This prevents uncorrelated data from being used in the interpolation process at scene boundaries.

3:2 Handling: Recognizes and handles the redundant fields inserted by the telecine during 24fps film to 30fps video conversion. By detecting 3:2 sequences it allows for better performance in the de-interlace process by maintaining the full vertical resolution.

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Aspect Ratio Control: Allows selection from standard aspect ratios such as common top and bottom, common sides, anamorphic, and Flexview

Detail Enhancement: Detail Enhancement is an edge-sharpening filter based on a traditional film compositing technique called 'unsharp masking'. This filter corrects any blurring introduced during image capture, compression or resampling.

Noise Reduction: Offers a greater degree of image quality through the use of temporal recursive noise reduction. The filter can be set in one of three levels of processing (Lo, Med, and Hi).

Formats and Delays

The Mini supports the input to output conversions shown in **Table 1**, based on the version ordered. The numbers show the associated processing delay, measured in frames of delay.

Table 1: Formats and Delays

Input Format	Output Format	Mini-UPC-2F	Mini-UPC-4F	Mini-DNC-2F	Mini-DNC-4F	Mini-UDCS	Mini-UDCSN
480i59.94	720p59.94	2	4			4	4
480i59.94	1080i59.94	2	4			4	4
576i50	720p50	2	4			4	4
576i50	1080i50	2	4			4	4
720p50	576i50			2	4	4	4
720p50	1080i50					4	4
720p59.94	480i59.94			2	4	4	4
720p59.94	1080i59.94					4	4
1080i50	576i50			2	4	4	4
1080i50	720p50					4	4
1080i59.94	480i59.94			2	4		
1080i59.94	720p59.94					4	4

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Packages

The Mini is available in the configurations shown in **Table 2**.

Table 2: Packages

Package	Details
Mini-UPC-2F	Up-converter, 2-Frame Mode Includes: Up-conversion with PixelMotion De-interlacing, Aspect Ratio Conversion, Colorspace Conversion, and Detail Enhance.
Mini-UPC-4F	High-quality Up-converter, 4-frame Mode Includes: Up-conversion with PixelMotion De-interlacing, Aspect Ratio Conversion, Colorspace Conversion, and Detail Enhance.
Mini-DNC-2F	Down-converter, 2-Frame Mode Includes: Down-conversion with PixelMotion De-interlacing, Aspect Ratio Conversion, Colorspace Conversion, and Detail Enhance.
Mini-DNC-4F	High-quality Down-converter, 4-Frame Mode Includes: Down-conversion with PixelMotion De-interlacing, Aspect Ratio Conversion, Colorspace Conversion, and Detail Enhance.
Mini-UDCS	Up/Down/Cross-converter Includes: Up, Down, Cross-conversion, Aspect Ratio Conversion, Colorspace Conversion, and Detail Enhance.
Mini-UDCSN	Up/Down/Cross-converter with Noise Reduction Includes: Up, Down, Cross-conversion, Aspect Ratio Conversion, Colorspace Conversion, Detail Enhance, and Noise Reduction.

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Chapter 2
Hardware

Rear Panel Connections

Figure 1: Rear Panel Detail

Power: Attach 12 VDC power supply

RS232: For command line interface

Serial Digital In: 1 x SDI (SD or HD) (BNC), 10-bit serial digital input

- SD at 270Mbps; Rec 601 with embedded audio SMPTE 272M
- HD at 1.485Gbps; SMPTE 292M with embedded audio SMPTE 299M

Loop: Active loop out of Serial Digital input

Out 1, 2: 2 x SDI (SD or HD) (BNC), 10-bit serial digital outputs

- SD at 270Mbps; Rec 601 with embedded audio per SMPTE 272M
- HD at 1.485Gbps; SMPTE 292M with embedded audio per SMPTE 299M

DVI-I Out (Optional): 1 x DVI-I, Digital Video Interface - Integrated

- Supports Digital and Analog Component Video
- Max resolution 1920x1200 @ 60p

HDMI (Optional): 1 x HDMI, High Definition Multimedia Interface

- Max resolution 1920x1200 @ 60p

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Front Panel

Figure 2: Front Panel Detail

OSD Button: Enables the On Screen Display (OSD) for setup and control of the Mini.

Pwr LED: Indicates that the Mini is on.

Status LED: Lights red to indicate a fault condition.

In Button: Used to scroll through the input formats (480i59.94, 576i5, 720p and 1080i). Each time the button is pressed, the Mini moves to the next available input format.

When the In button is pressed, the Mini enters the input select mode. In this mode, each time the IN button is pressed, the Mini advances to the next available input format, indicated by a yellow LED on the Input Format LEDs. Once the input and output format have been selected, pressing the Enter (ENT) key enables the selected formats.

Input Format LEDs: Indicates the current input format (480, 576, 720, 1080). If the LED is green, it indicates that the current input is OK. If the LED is red, it indicates that there is a problem with the current input.

Out Button: Used to scroll through the output formats (480i59.94, 576i50, 720p and 1080i). Each time the button is pressed, the Mini advances to the next available output format.

When the Out button pressed, the Mini enters the output select mode. In this mode, each time the Out button is pressed, the Mini advances to the next available output format, indicated by a yellow LED on the Output Format LEDs. Once the input and output format have been selected, pressing the Enter (ENT) key enables the selected formats.

Output Format LEDs: Indicates the current output format (480, 576, 720, 1080). If the LED is green, it indicates that the current input is OK.

Arrow Buttons: Used to navigate through the OSD. Also used to adjust slider controls in Picture Setting menu.

ENT: Used to select items in the OSD. It is also used to enable the currently selected input / output formats. Once the input and output formats have been selected, pressing the Enter (ENT) key enables the selected formats. Once enabled, the Input and Output Format LEDs show green.

IR Port: Infrared receiving port. Used for IR remote control of the OSD.

Reset: Resets the Mini, same as a power cycle.

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Chapter 3
Configuring The Mini

On Screen Display (OSD)

The On Screen Display (OSD) is used to adjust the configuration settings for the Mini.

Picture Menu

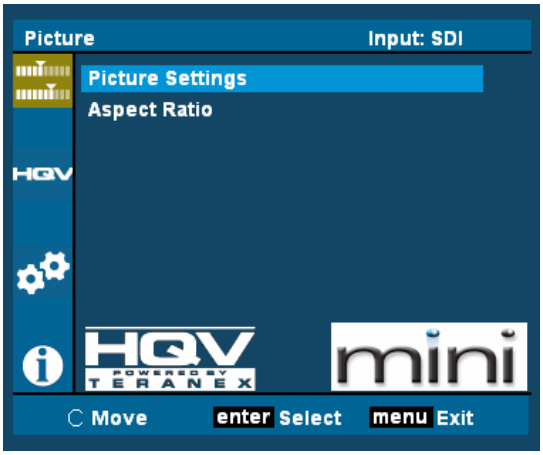

Figure 3: Picture Menu

The Picture Menu provides access to the Picture Setting (Proc Amp) adjustments and the Aspect Ratio selections, see **Figure 3**.

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Picture Settings Menu

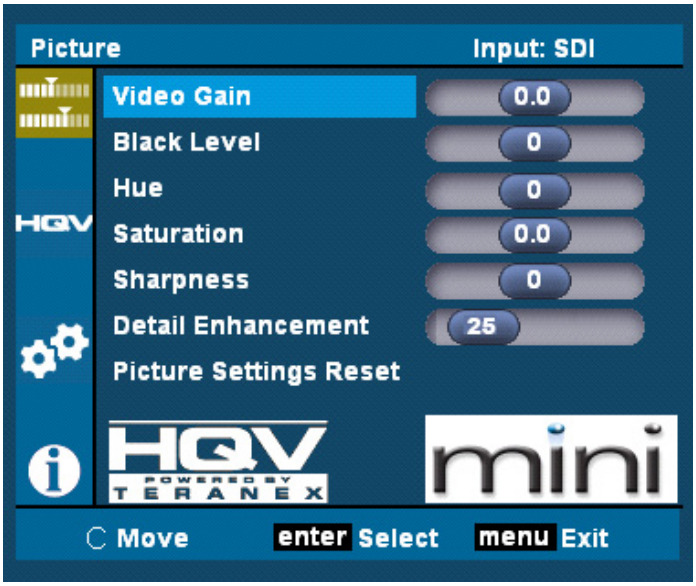

Figure 4: Picture Settings Menu

The Picture Settings Menu provides access to the parameters listed below, see **Figure 4**.

Video Gain Slider: Sets the overall amplitude of the output video signal. The range of the control is -6.00dB to +6.00dB.

The Left and Right arrow keys increase or decrease the setting by 0.1. The Up and Down arrow keys increase or decrease the setting by 1. Pressing Enter brings you back to the Picture Settings Menu.

Black Level Slider: Adjusts the black level of the output video signal. The range of the control is -30 mV to +30 mV.

The Left and Right arrow keys increase or decrease the setting by 1. Pressing Enter brings you back to the Picture Setting Menu.

Hue Slider: Adjusts the phase of the output video signal. The range of the control is -179 degrees to +178 degrees.

The Left and Right arrow keys increase or decrease the setting by 1. The Up and Down arrow keys increase or decrease the setting by 10. Pressing Enter brings you back to the Picture Setting Menu.

Saturation Slider: Adjusts the Chroma Saturation of the output video signal. The range is -6.0dB to +6.0dB.

The Left and Right arrow keys increase or decrease the setting by 0.1. The Up and Down arrow keys increase or decrease the setting by 1. Pressing Enter brings you back to the Picture Setting Menu.

Sharpness Slider: Adjusts the Sharpness of the output video signal. The range of the control is -50 to +50.

The Left and Right arrow keys increase or decrease the setting by 1. The Up and Down arrow keys increase or decrease the setting by 10. Pressing Enter brings you back to the Picture Setting Menu.

Detail Enhancement Slider: Allows the user to soften or sharpen the detail in the image. The range of the control is 0 to 100.

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The Left and Right arrow keys increase or decrease the setting by 1. The Up and Down arrow keys increase or decrease the setting by 10. Pressing Enter brings you back to the Picture Setting Menu.

Picture Settings Reset: Resets all Picture Setting sliders to the nominal position.

Aspect Ratio Menu

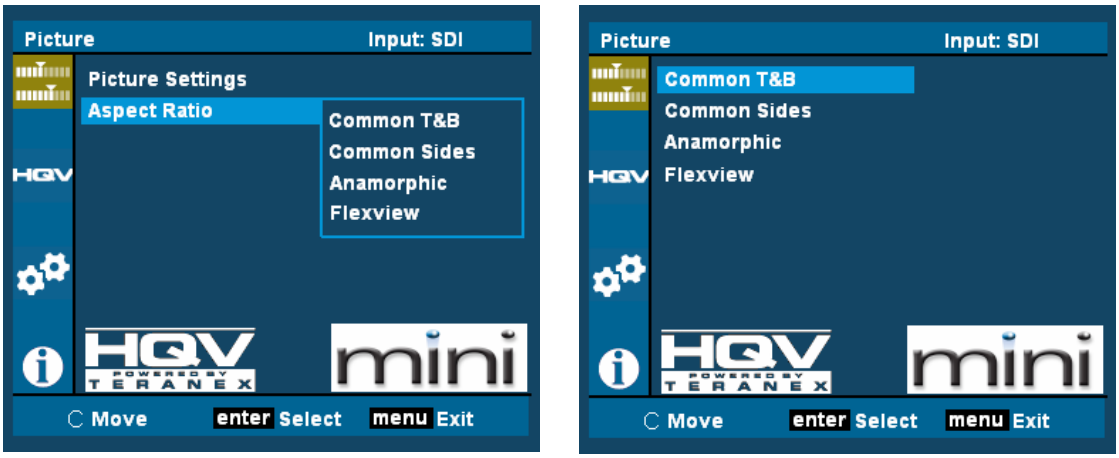

Figure 5: Aspect Ratio Menu

The Aspect Ration Menu provides access to the parameters listed below, see **Figure 5**.

Common T&B: Ensures that the top and bottom edges of the input image match the top and bottom edges of the output aspect ratio. For example, if the input aspect ratio were 4:3 and it was passed on to a 16:9 display using the common top and bottom method, the original 4:3 image would appear centered in the 16:9 display with black bars, or pillars, on the left and right side.

Common Sides: Ensures that the left and right edges of the input image match the left and right edge of the output aspect ratio. For example, if the input aspect ratio is 4:3 and the output aspect ratio is 16:9, the left and right edges of the input image are stretched to match the left and right edges of the output. In order to maintain correct geometry of the image, the input image is then stretched vertically as well. This has the same result as zooming in on the image. While this method maintains correct geometry and fills the entire output display, it also results in an overall loss of approximately 33.33% of the input information in the vertical domain. This loss of information is split evenly between the top and bottom of the image.

Anamorphic: This mode is similar to common top and bottom in that it ensures that the top and bottom edges of the input aspect ratio match the top and bottom edges of the output aspect ratio. It also, however, stretches the image horizontally to fill the output 16:9 aspect ratio. This mode is designed for use with material that was originally captured with an anamorphic lens, thereby generating an output image with correct geometry when stretched horizontally to 16:9.

When used with standard 4:3 material, it will have the effect of stretching the material horizontally causing circles to appear as ovals, etc.

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Flexview: (available in 480i59.94 to 720p 59.94 & 1080i59.94 and 576i50 to 720p50 & 1080i50 up-conversions) is a non-linear anamorphic aspect ratio designed for use when converting 4:3 material to 16:9 without the traditional distortion of a normal anamorphic stretch. Flexview leaves the center portion of the image untouched but provides increasing amounts of stretch towards the edges of the image, filling the 16:9 image without distorting the center action area.

Advanced Menu

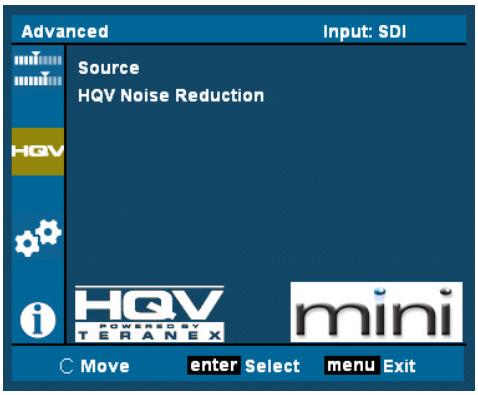

Figure 6: Advanced Menu

The Advanced Menu provides access to Source selection, which allows the user to define whether the incoming material is Video or Film, or if the Mini should use Auto detection to make the determination. It also provides access to the Temporal Recursive Noise Reduction controls, see **Figure 6**.

Source Menu

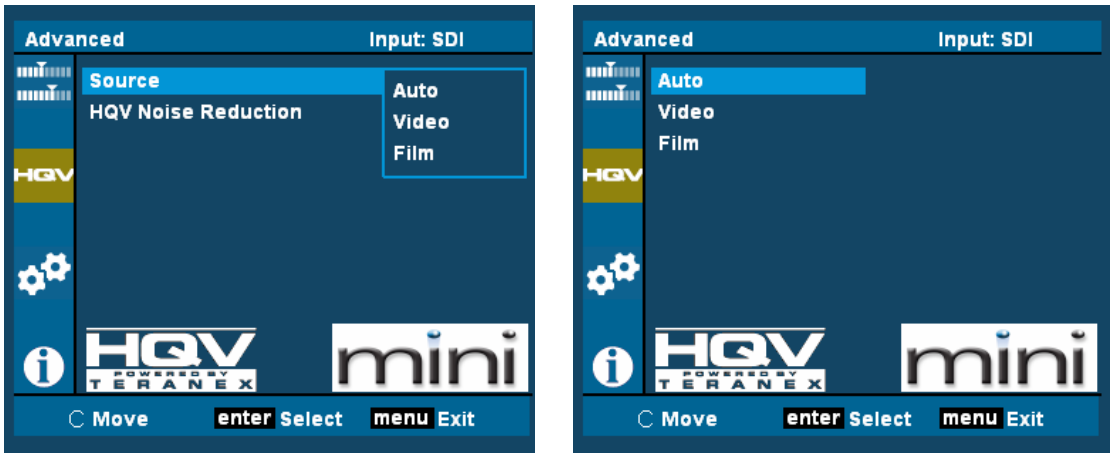

Figure 7: Source Menu

The Source Menu provides access to the parameters listed below, see **Figure 7**.

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Auto: This mode makes video/film decisions on the fly at the pixel level. This should be the default for most applications, especially if there is a mixture of video and film, or video credits over a film background.

Video: Select this mode if the source material is interlaced video material. This mode will optimize the algorithms for processing interlaced material.

Film: Select this mode when the source material is film-originated. This mode will optimize the algorithms for processing film-originated material and will provide options for the various cadence issues associated with processing video recordings of film-originated material.

Noise Reduction Menu

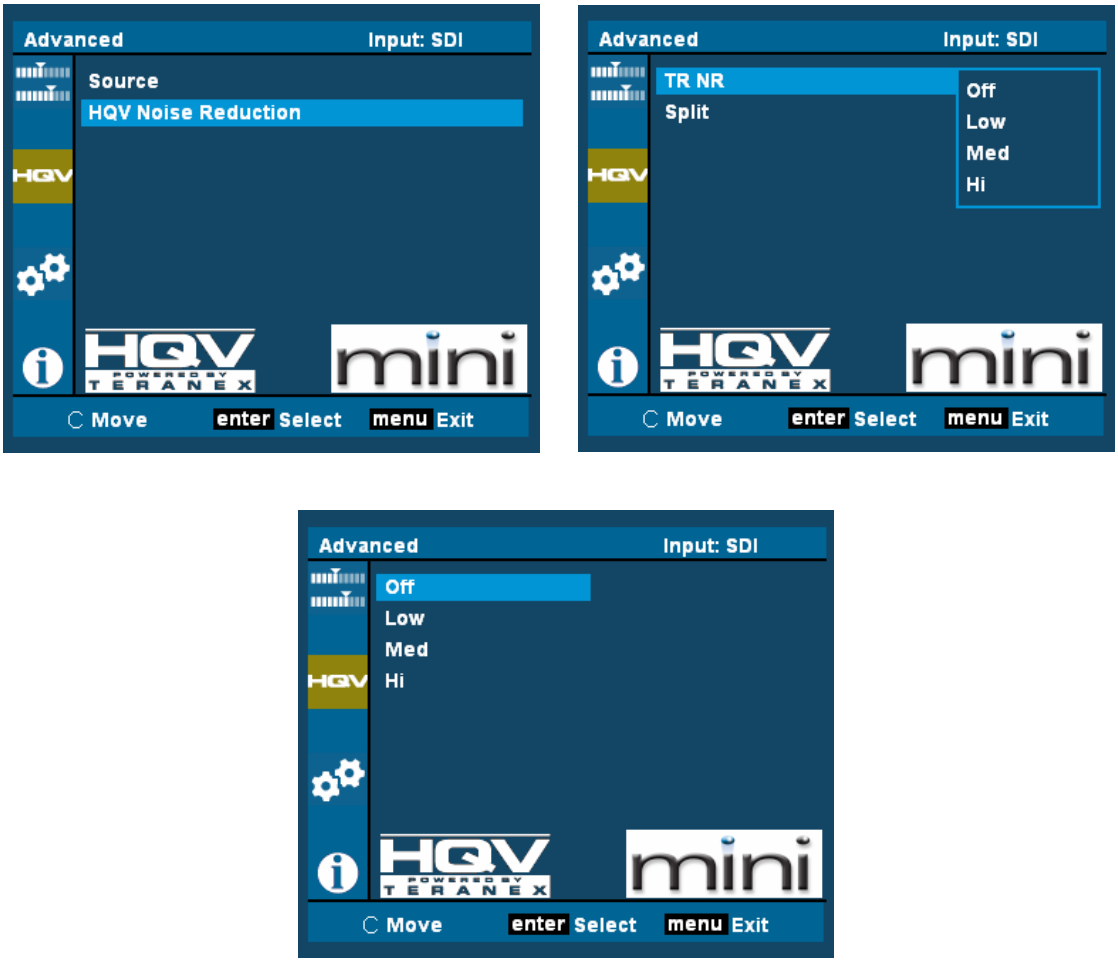

Figure 8: Noise Reduction Menu

The Noise Reduction Menu provides access to the parameters listed below, see **Figure 8**.

NOTE: This Noise Reduction and Split feature are only available in the Mini-UDCSN.

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Temporal Recursive Noise Redution: This Noise Reducer is a motion adaptive temporal recursive filter that removes random and Gaussian noise. Each pixel is labeled as motion, no motion, or noise. Each of these classes of pixels is treated differently in the noise reduction process. For pixels in which there is no motion, low-level Gaussian noise may be reduced via temporal processing by a weighted averaging over successive frames. For pixels labeled as random noise, spatial processing replaces these pixels. Pixels labeled as being 'in motion' are retained unchanged to avoid artifacts that may be introduced through temporal processing.

Off: Disables the noise reduction filter.

Low: Enables the Temporal Recursive Filter in the Low Noise Mode.

Med: Enables the Temporal Recursive Filter in the Medium Noise Mode.

Hi: Enables the Temporal Recursive Filter in the High Noise Mode.

Split

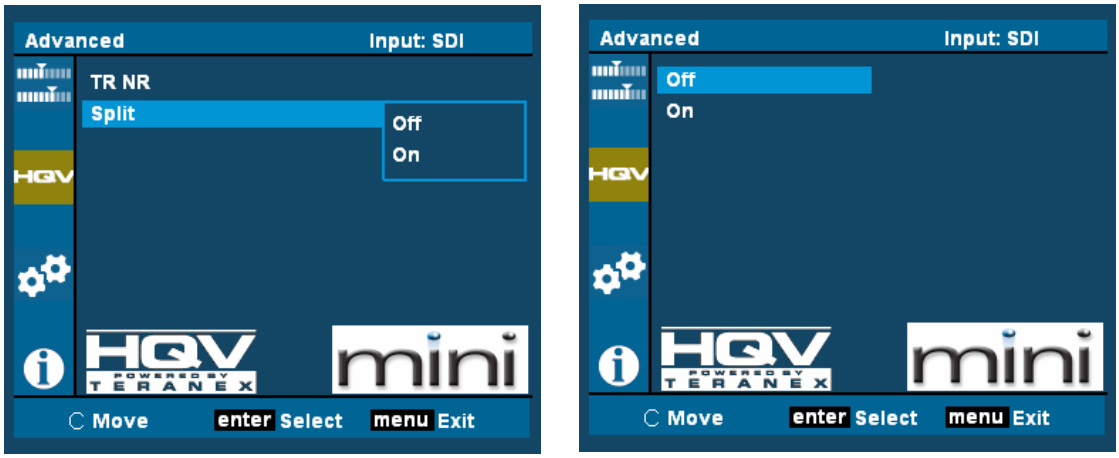

Figure 9: Split Menu

The Split Menu allows the user to turn the split screen mode on or off, see **Figure 9**.

On: Enables the split screen mode. In split screen mode, the left half of the image is unprocessed and the right half shows the processing effect of the Temporal Recursive Noise Reduction.

Off: Disables the split screen mode.

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Setup Menu

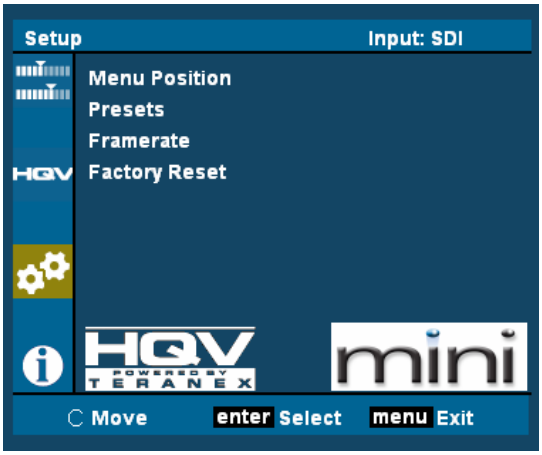

Figure 10: Setup Menu

The Setup Menu provides access to the Menu Position controls, the User Presets, Framerate, and the Factory Reset control, see **Figure 10**.

Menu Position

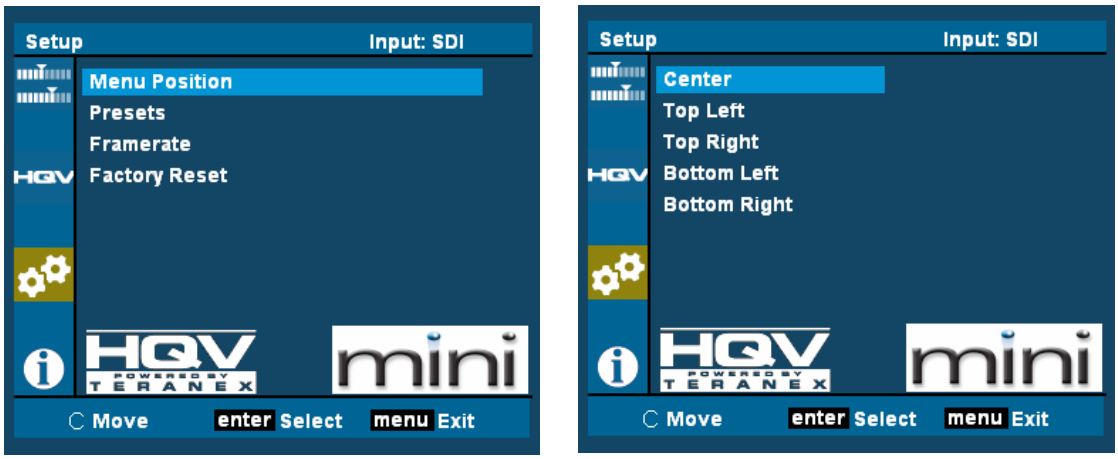

Figure 11: Menu Position Menu

The Menu Position Menu allows the user to define where the menus are to appear on the screen, see **Figure 11**.

Center: Places the On Screen Display (OSD) Window over the Center portion of the screen.

Top Left: Places the On Screen Display (OSD) Window over the Top, Left portion of the screen.

Top Right: Places the On Screen Display (OSD) Window over the Top, Right portion of the screen.

Bottom Left: Places the On Screen Display (OSD) Window over the Bottom, Left portion of the screen.

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Bottom Right: Places the On Screen Display (OSD) Window over the Bottom, Right portion of the screen.

Presets

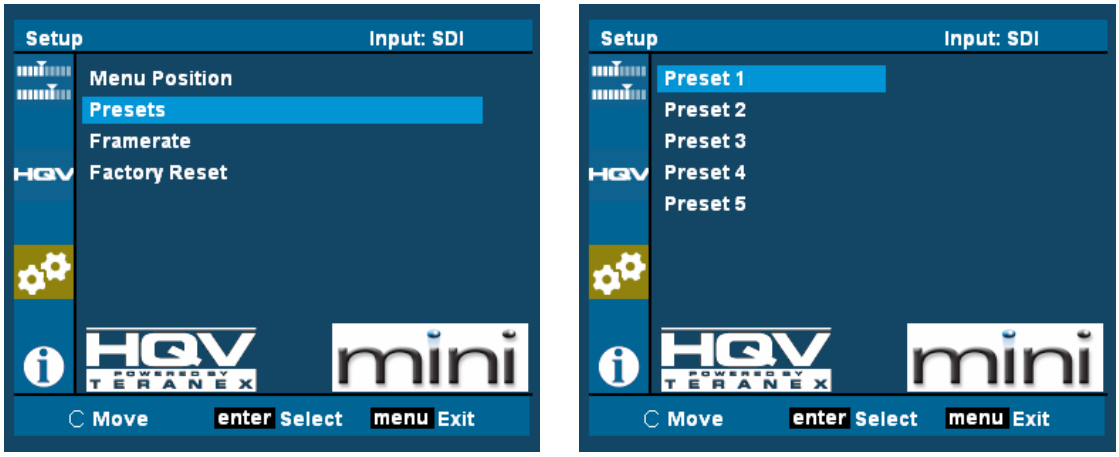

Figure 12: Presets Menu

Preset 1–5: Allows the user to save and recall all settings for the Mini into one of five Preset memories, see **Figure 12**.

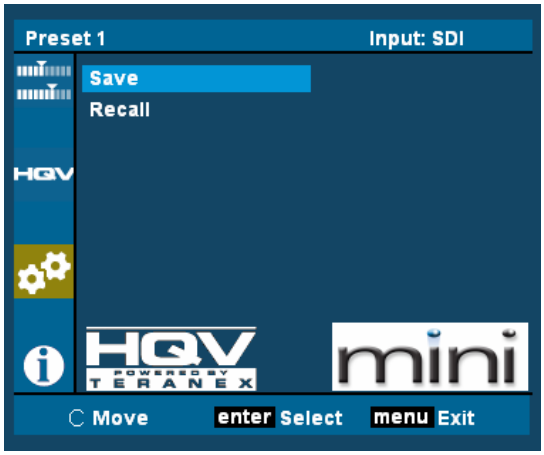

Figure 13: Save / Recall Menu

The Save / Recall Menu allows the user to save settings to a Preset memory, or to recall settings from a Preset memory, see **Figure 13**.

Save: Saves the current settings of the Mini to the selected Preset.

Recall: Loads the selected Preset.

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Frame Rate Mode

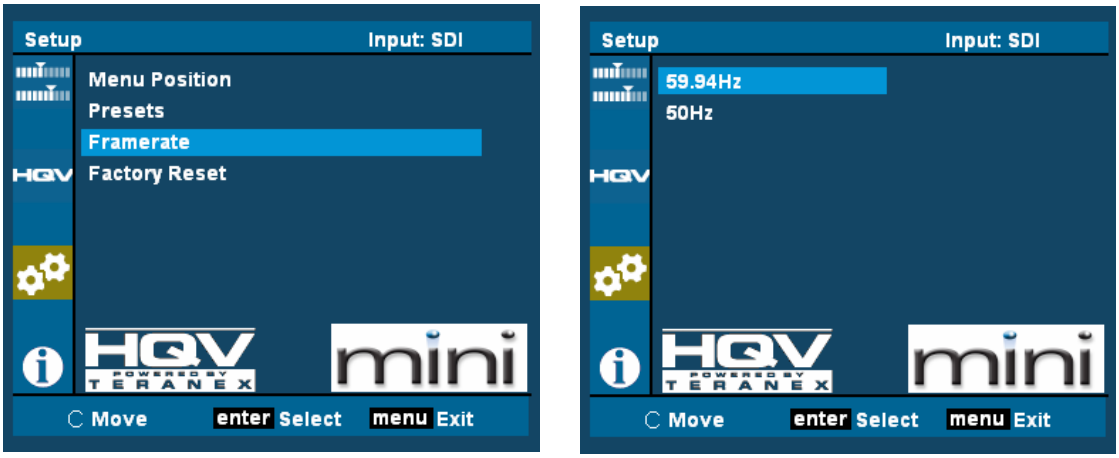

Figure 14: Frame Rate Mode Menu

The Frame Rate Mode Menu allows access to the frame rates listed below, see **Figure 14**.

59.94Hz: Sets the input frame rate to 59.94Hz. In this mode, the available input formats are 480i59.94, 720p59.94, and 1080i59.94. The availability of these formats will also be determined by the Mini model ordered. See **"Packages"** on page 4 for further details.

50Hz: Sets the input frame rate to 50Hz. In this mode the available input formats are 576i50, 720p50, and 1080i50. The availability of these formats will also be determined by the Mini model ordered. See **"Packages"** on page 4 for further details.

NOTE: The Frame Rate mode can also be set from the front panel during power on if the OSD is unavailable.

To set the frame rate, press and hold the following button while connecting power to the Mini:

59.94Hz: Press and hold the Up Arrow button.

50Hz: Press and hold the Down Arrow button.

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Factory Reset

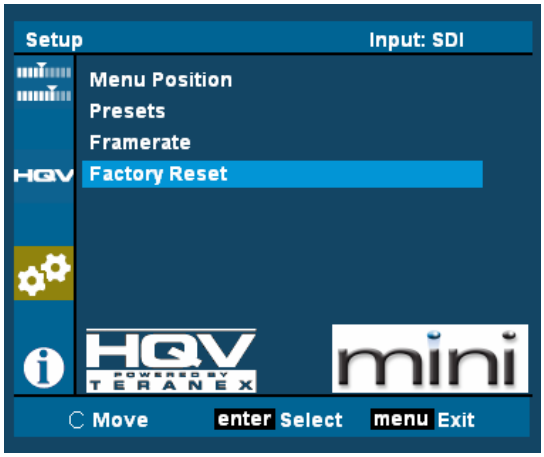

Figure 15: Factory Reset Menu

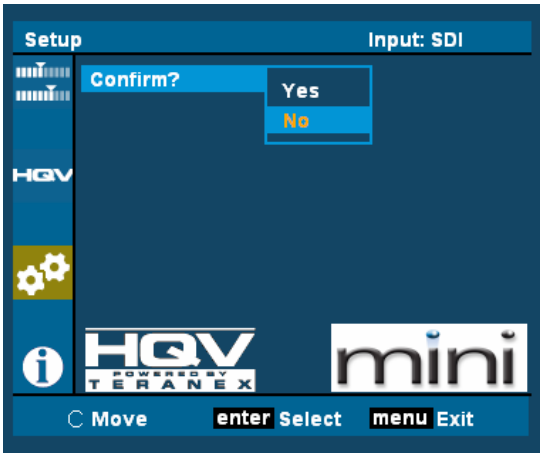

Figure 16: Confirm Reset

The Factory Reset Menu and the Confirm Reset Menu allow the user to reset the Mini to the factory default settings, see **Figure 15** and **Figure 16**. See **"Factory Reset Settings" on page 19** for more information on the factory default settings and their values.

Yes: Restores the Factory Default settings.

No: Cancels the Factory Reset.

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Information

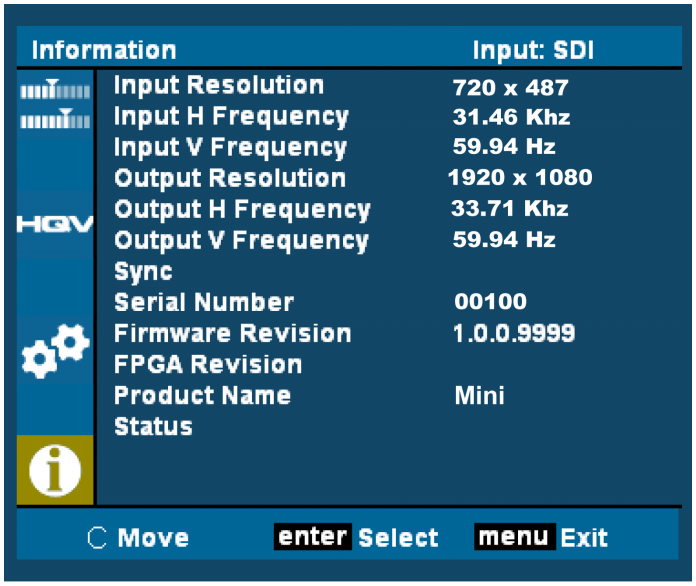

Figure 17: Information Menu

The Information Menu displays the current settings of the Mini, see **Figure 17**.

Input Resolution: Shows the currently selected input resolution.

Input H Frequency: Shows the horizontal frequency of the currently selected input.

Input V Frequency: Shows the vertical frequency of the currently selected input.

Output Resolution: Shows the currently selected output resolution.

Output H Frequency: Shows the horizontal frequency of the currently selected output.

Output V Frequency: Shows the horizontal frequency of the currently selected output.

Sync: Shows the current Sync Mode.

Serial Number: Shows the Mini's serial number.

Firmware Revision: Show the firmware revision number.

FPGA Revision: Shows the FPGA revision number.

Product Name: Shows the Mini Product Name.

Status: Displays the Mini's current status.

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Appendix A
Factory Reset Settings

The Factory Reset Settings are shown in Table 3.

Table 3: Factory Reset Settings

Item	Setting
Input Format	Last setting used
Output Format	Last setting used
Video Gain	0dB
Black Level	0mV
Hue	0
Saturation	0dB
Sharpness	0
Detail Enhancement	25
Aspect Ratio	Common T&B
Source	Auto
Noise Reduction	Off
Menu Position	Center
Framerate	Last setting used

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